# 4-H COMPUTER PROJECT III:
## Using computers in 4-H Projects

CANADA

4-H is for all young people ages 9 through 19. Young people in 4-H can choose from a wide range of educational activities and have fun while learning. Contact your county 4-H agent to learn how you can participate in the many projects and activities for young people.

# 4-H Computer Project III
## *Using Computers in 4-H Projects*

## Introduction

In 4-H Computer Project I, you learned about some of the components of small computers, how to load a program from a cassette tape or diskette, and how to run and respond to a program. In 4-H Computer Project II, you learned about programming and how commands direct the computer to do useful things.

This more advanced project will challenge you to use microcomputer programs in various 4-H activities, perhaps even developing your own programs to use. The project requires access to a microcomputer to fully develop and apply programs. This project also provides some guidelines on reviewing and selecting a microcomputer for your present or future needs.

If your 4-H group does not have a microcomputer available, try to find a friend (or a school or business) who has a microcomputer on which you can practice. Learning to use or to program a computer is just like learning to play a piano; you must sit down at a keyboard to really master the instrument.

## What You Will Learn in This Project

- Helpful pointers on microcomputer hardware and software
- Ways to use microcomputers in 4-H projects
- Potential benefits of microcomputers
- How to plan and develop your own programs
- How flowcharts can help you plan and organize a computer program
- How to use ARRAYS and DATA-READ statements

## What You Will Do in This Project

- Review computer terms and commands.
- Use available programs for various activities.
- Plan a program.
- Develop your own program.
- Give a demonstration about the computer or a program.
- Keep a record of your 4-H computer project.



3

# A Review of What You Have Learned

Let's review what you learned in the first two computer projects. You must have a good understanding of the information in these two project booklets before you can learn more about computers. To help you review, write a brief sentence about the following components of a microcomputer and what each does.

HARDWARE _____

_____

SOFTWARE _____

_____

VIDEO DISPLAY _____

_____

KEYBOARD _____

_____

RAM MEMORY _____

_____

DISKETTE _____

_____

PRINTER _____

_____

CPU stands for

C _____

P _____

U _____

Looking at the components of the computer represented below, draw the arrows to indicate the flow of information.
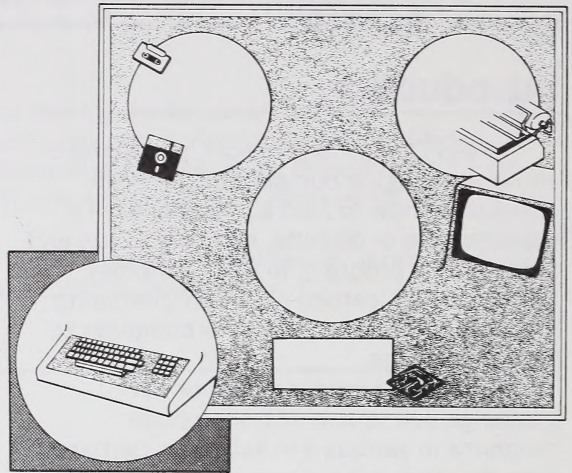


The keyboard is the means by which you "communicate" to the computer. Briefly explain what each of the following important keys does.

CLEAR _____

_____

BREAK _____

_____

ENTER or RETURN _____

_____

SHIFT _____

_____

SPACE BAR _____

_____

\*  _____

_____

\+  _____

_____

\-  _____

_____

/  _____

_____

O  _____

_____

Ø  _____

_____

You have already learned how to type certain words on the keyboard and then enter them in the computer to make it do certain things for you. These are called _____ words. Briefly explain what the following words cause the computer to do.

PRINT _____

_____

TAB _____

_____

RUN _____

_____

CLS _____

_____

HOME _____

_____

LIST _____

_____

INPUT _____

_____

A$ _____

_____

B _____

_____

What is the **"prompt"** symbol and what does it mean?

_____

_____

What is the **"cursor"** symbol and what does it mean?

_____

_____

# Choosing A Microcomputer

More and more people are buying computers every day, and there are many types from which to choose. New models are becoming available nearly every month—a trend which may continue for several years. You may wonder which microcomputer is the best to use in your 4-H project or other home, school or personal use. If a microcomputer is already available, you are ready to begin—provided it has the software support and features you will need. However, many 4-H'ers will be interested in buying their own microcomputer someday, maybe soon, or in helping others select equipment. To learn more about microcomputers, you should

review books in the library, obtain issues of current magazines, visit local computer stores, and talk with teachers, leaders, and friends about the equipment they use. The following brief pointers on microcomputer hardware features will help you better understand which equipment might best suit your needs.

**Portability:** Quite powerful microcomputers from pocket or book size units up to tabletop sizes are available. Factors to consider include the size, weight, whether the microcomputer is one unit or has components with cables, and the cost.

**Memory capacity (RAM):** A memory of at least 16K is essential for beginning programs. Up to 48K or 64K is widely available and preferred since these capacities allow you to develop and use larger programs.

**Keyboard:** Most all keyboards have the keys arranged like a typewriter and have raised keys. However, some economical units have "membrane" type key switches that require pressure on an exact spot. These are not as easy and fast to use as regular keys. An extra set of keys in a separate group (numeric keypad) is helpful for data entry.

**Video display:** Video displays range from a 25-30 character one-line LCD display on a pocket-size microcomputer to the 12- to 13-inch monochrome or color monitors. If you plan long-time use and viewing, the video display would be more desirable. These displays feature line lengths of 32 to 80 characters and 16 to 24 lines (80 by 24 is the industry standard for professional computers). If you want compactness and easy portability, the multi-line LCD character displays may be more appropriate.

**Color or monochrome video:** The availability of microcomputers with color video output provides exciting opportunities and challenges. Often the only extra cost is the color monitor to display the color creations.

**Graphics:** High resolution graphics enable fine detail for symbols, illustrations, and other creations. Good graphics features are available on both monochrome and color microcomputers, but a proper video monitor is necessary to display the graphics.

**Musical tones:** Several octaves of simple musical tones are available in some microcomputers for those who want to develop musically related programs or tunes.

**Cassettes or diskettes:** A cassette recorder and tapes are economical but slow and limited in data access and versatility. The floppy disks and disk drives are much faster and offer many conveniences and advantages at a reasonable cost. Any microcomputer intended for serious use should have the capability of adding disk drives.

**Printer:** An economical printer is a desirable accessory to provide printed copies of the results of the microcomputer's output. Many capable and economical dot matrix printers are available using single sheet or continuous form paper.

**RS232C Serial Interface:** This component allows a microcomputer to "communicate" with other microcomputers or with larger computers over the telephone lines or similar networks. A MODEM is also needed to connect the RS232C device to the telephone circuit.

# What Software Is Available?

Thousands of software programs are available for the popular brands of microcomputers. This software ranges from the arcade type games to very useful home, business and educational programs. Several 4-H related programs have been developed and are available free from your 4-H Extension agent or leader. Many other programs are available from microcomputer user groups, friends, schools, computer stores or catalog sources. Some programs are free. Others may cost a few dollars or several hundred dollars depending on the scope and complexity. Much commercial software is "copyrighted" which means it is not legal to make copies. Proper selection and use of

software will greatly influence the usefulness and benefits of a microcomputer.
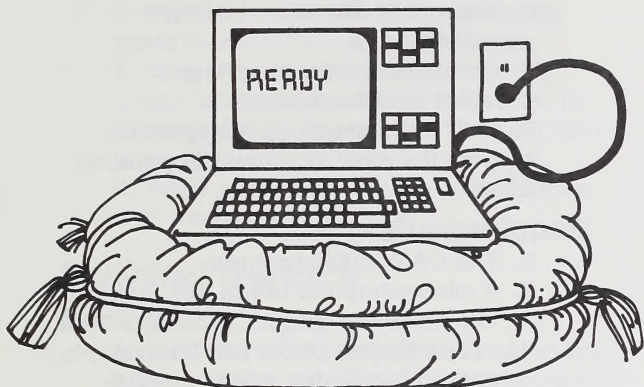


Software can be divided into two categories: 1) general purpose and 2) specific applications. General purpose commercial software allows several applications to be made from each program. For example,

- *Word processing software* may be used for letters, documents or reports, etc. It includes features such as page length, margin, editing, etc.
- *Mailing list software* may be used to print labels, automatically insert addresses in letters, sort by name, city, state, zip, or other coded data.
- *File management software* enables the entering of many records on personnel, products, equipment, etc., and accessing, sorting, or printing any single record or groups of records in a matter of seconds.
- *Financial and accounting software* provides numerous options of financial applications such as budgets, balance sheets, payroll, general ledger, accounts receivable, accounts payable, etc.
- *Electronic spreadsheets* provide a grid-like structure for entering, tabulating, projecting, and printing extensive numerical data with titles, summaries and other notations.

Software for specific applications includes programs for home energy analysis, diet and nutritional analysis, irrigation scheduling, crop drying and system design, crop and animal performance records, chemical applications, building designs and estimated costs, etc.

## Should You Use Available Software or Develop Your Own?

Both, depending on your needs and the resources available! Ignoring the availability and use of existing software is poor judgment and careless oversight. However, some software may have a cost that you, your agents, leaders, teachers, or friends cannot afford, so you will have to rely on the free or affordable sources. The real challenges and satisfaction of using microcomputers come about when you develop your own useful programs.

The remainder of this project will guide you in learning to use available software and in developing your own new programs for your 4-H, home, farm, ranch, or school needs.

## Using Existing 4-H Software

Several programs have been developed for use with some of the popular microcomputers as part of this 4-H computer project. These are available from your 4-H agent or leader. If the microcomputer available to you will not use these versions, then you might undertake modifying and adapting the BASIC language of the program to work on your microcomputer. This assumes you have learned programming in BASIC well enough to do the conversion. If not, perhaps you can review Project II, read other programming books and/or get help from a friend, teacher, or leader.

Here's how you can use some of the programs.

## Program: *FUELCOST*

### Benefits:
1. Determine annual fuel costs of your family vehicles.
2. Compare fuel efficiency and savings of several vehicles.
3. Learn how to economize on automobile fuel costs.

### Requirements:
1. The *FUELCOST* program
2. A microcomputer to run this program
3. The following data for each car:
   a. average miles driven daily
   b. average miles per gallon of fuel
   c. cost of fuel per gallon

### Procedures:
1. Obtain the above data for one or more cars.
2. Prepare the *FUELCOST* program for operation on the microcomputer.
3. Enter the above data when requested by the program.
4. Write down the annual fuel costs for the vehicles.

   vehicle model: _____

   _____

   annual fuel costs: _____

   _____

5. Show the results to the owners of the vehicles and suggest ways to economize with tune-ups, fewer trips, carpooling, combined errands, etc.
6. Remember that fuel costs alone are only part of a car's total annual costs. The car operating costs program (*CARCOS83*) gives a more complete analysis of a car's annual cost.
7. Write a summary of your experiences with this program.

## Program: *CARCOS83*

### Benefits:
1. Determine overall annual car operating costs.
2. Compare costs and savings of different models of cars.
3. Plan for future car purchases that provide the most economical operating costs.

### Requirements:
1. The *CARCOS83* program
2. A microcomputer to run this program
3. The following data for each car:
   a. size category of the car; for example, standard 8-cylinder, intermediate 6-cylinder, compact 6- or 4-cylinder, sub-compact 4-cylinder
   b. annual insurance costs
   c. annual license registration fee
   d. average miles driven per day
   e. average miles per gallon of fuel
   f. cost of fuel per gallon

### Procedures:
1. Obtain the above data for the cars.
2. Prepare the *CARCOS83* program for operation on the microcomputer.
3. Enter the data when requested by the program.
4. Write the following results:

   car model: _____

   _____

   miles driven: _____

   _____

   annual costs: _____

   _____

   cost/mile: _____

   _____

   which car is more economical:

   _____

   _____

**7.** Compare the cost of trading a car for a more economical model and how long it will take for the savings in operating costs to offset the cost of trading.

**8.** Give a demonstration to your 4-H group, school class, community club, or other group on the results of this car cost analysis.

**9.** Write a summary of your experiences with the car cost program.

## Program: *GARDEN*

### Benefits:

**1.** Have the most productive and efficient garden for the number of people in your family in the space available.

**2.** Determine the estimated cost of seeds and plants required.

**3.** Determine the estimated value of products grown.

**4.** Review or learn ways to serve, freeze, can, or otherwise preserve the harvested vegetables for home use. (Refer to other 4-H projects or check with your Extension agent.)

### Requirements:

**1.** The *GARDEN* program

**2.** A microcomputer to run the program

**3.** Selection of any of 36 listed vegetables

**4.** A data input form, if you use the program at an exhibit, to accommodate large numbers of people more conveniently

### Procedures

**1.** Prepare the *GARDEN* program for operation. (Note: some data in the program on planting and harvesting dates may have to be modified for your region of the U.S.)

**2.** Enter the number of people the garden will produce for.

**3.** Select the vegetables to be grown.

**4.** Display or print the results.

**5.** Write the following results:
number of people to
produce for _____

square feet of area
required _____
approximate cost of seeds
and plants _____
approximate value of products
to be grown _____
returns of your garden
_____ cents/sq. ft.

**6.** Make other vegetable selections and compare the area, costs, and yield.

**7.** Help friends and neighbors plan their garden.

**8.** Organize and conduct garden projects for the summer.

**9.** Give a demonstration on how to plan a good garden and use the vegetables produced.

**10.** Write a summary about your experiences with the *GARDEN* program.

# Using Commercial Software

Numerous programs to perform useful tasks are available for most all microcomputers. They may be purchased from computer stores, catalogs and magazines. The general-purpose software described in a previous section is widely used in offices, by businesses, farmers, ranchers, teachers and even in homes. The top quality software has been developed and tested by professional programmers and capable users over many months or years. It should be error-free, easy to use and supported with good instructional manuals. The cost varies depending on the capabilities and market competition.

The following activities will guide you to learn more about such software, its availability in your community, how it is being used and ways you might use it for 4-H projects.

**Program:** *Word Processing Software*

## Benefits:

1. Prepare letters, reports, documents, etc.
2. Make changes, corrections, additions, deletions, etc., readily and easily.
3. Format page margins, lengths, etc.
4. Print one or several copies.
5. Save the final version on diskette for future uses.

## Requirements:

1. A microcomputer and printer
2. The word processing software and the instruction manual for its use
3. Assistance in the proper use of the equipment and the software
4. A brief letter, report, announcement or minutes of club meeting, etc., which you wish to type and have several copies produced

## Procedures:

1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type your letter, report, etc.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future uses.
7. Print a hard copy and double-check for correctness, margins, etc.
8. If you find errors or changes, make the corrections, save the corrected version, and reprint one or more copies as needed.
9. Write results of your activity here:

   a. Whose equipment did you use?

   _____

   _____

   b. What was the name of the commercial software?

   _____

   _____

   _____

   c. What letter, report, etc. did you prepare?

   _____

   _____

   _____

   d. Did you learn to make corrections?

   _____

   _____

   _____

   e. What were some of the corrections you had to make?

   _____

   _____

   _____

   f. How many copies did you make?

   _____

9. Describe some advantages and disadvantages of the software you used.

   _____

   _____

   _____

   _____

   _____

10. What are some other uses of word processing software?

   _____

   _____

11. Write a school report, news article or give a demonstration on the capabilities of word processing software and how it can be used.

**Program:** *Mailing List Software*

**Benefits:**

1. Have accurate names and addresses of friends, club members, relatives, etc.
2. Prepare mailing labels for envelopes.
3. Print lists so others can have up-to-date rosters.
4. Make changes as people move or membership status changes.
5. Save the final version on diskette for later uses without retyping.

**Requirements:**

1. A microcomputer and printer
2. The mailing list software and instruction manual for its use
3. Assistance in the proper use of the equipment and software
4. Names and addresses you wish to have typed and copies or labels produced

**Procedures:**

1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type your names and addresses.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future uses.
7. Print a hard copy and double-check for correctness, margins, etc.
8. In case of errors or changes, make the corrections, save the corrected version, and reprint the copies needed.
9. Write results of your activity here:

   a. Whose equipment did you use?

   _____

   _____

   b. What was the commercial name of the software?

   _____

   _____

   c. Whose names and addresses did you use?

   _____

   _____

   _____

   _____

   d. Did you learn to make corrections?

   _____

   _____

   e. What were some corrections you had to make?

   _____

   _____

   f. How many copies did you make?

   _____

   g. Describe some advantages and disadvantages of the software you used.

   _____

   _____

   _____

   _____

10. What are some other uses of mailing list software?

   _____

   _____

11. Write a school report, news article or give a demonstration on the capabilities of mailing list software and how it can be used.

**Program:** *Electronic Spreadsheet Software*

## Benefits:
1. Prepare tables of data with titles in column and row form.
2. Prepare income and expense lists, a treasurer's report, budgets, financial statements, etc., with summaries of desired columns and rows.
3. Update change of value and related results immediately.
4. Print copies for distribution.
5. Save the final version on diskette for later use without retyping.

## Requirements:
1. A microcomputer and printer
2. Electronic spreadsheet software and the instruction manual for its use
3. Assistance in using the equipment and the software
4. Data or information such as a treasurer's report, income and expenses, budget, etc., that you wish to have typed and copies produced

## Procedures:
1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type in your data or information, etc.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future use.
7. Print a hard copy and double-check for correctness, margins, etc.
8. If there are errors or changes, make corrections, save the corrected version, and reprint copies as needed.
9. Write results of your activity here:

   a. Whose equipment did you use?

   _____

   _____

b. What was the name of the commercial software?

_____

_____

c. What data or information did you use?

_____

_____

d. Did you learn to make corrections?

_____

e. If so, what were some corrections you made?

_____

_____

_____

_____

f. How many copies did you make?

_____

g. Describe some advantages and disadvantages of the software you used.

_____

_____

_____

_____

10. What are some other uses of electronic spreadsheet software?

_____

_____

11. Write a school report, news article or give a demonstration on the capabilities of electronic spreadsheet software and how it can be used.

# Developing Your Own Software

Those of you who are advanced or eager 4-H members will want to develop your own programs. There are numerous programs you can develop which will be useful in your other 4-H projects. This section presents several topics and outlines procedures for you to use in developing programs. However, you must first learn and understand flowcharting—a helpful technique for planning and developing your software.
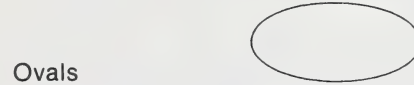
## Flowcharting

Working at a computer is fun, however, to be a good programmer you first need to use a pencil and paper to plan and practice writing programs. Writing a computer program is somewhat like building a house, assembling a bicycle or following a recipe. You must put many different ideas and actions together in a certain way. If you do not follow the steps correctly, the results will not be what you expect and probably not what you want.
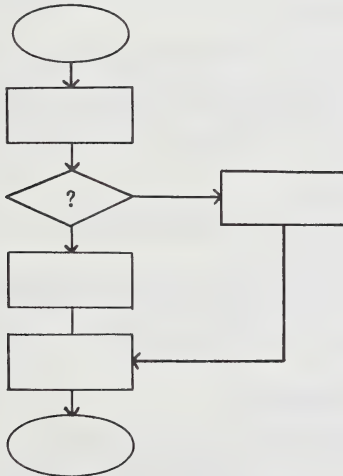


Do you remember the flowcharts briefly included and described in Project II? Those flowcharts diagram the step-by-step procedure followed by the program. *A FLOWCHART IS A SET OF DIRECTIONS PLACED IN BOXES AND CONNECTED BY ARROWS TO SHOW THE ORDER IN WHICH THE COMPUTER SHOULD READ OR PERFORM THE PROGRAM DIRECTIONS.*

The flowchart diagrams the step-by-step procedure for solving a problem. A flowchart uses certain symbols or diagrams that you should understand. Write the meaning for the following flowchart symbols below (refer to Project II if necessary).

**Flowchart Symbols**



Ovals

**Meaning** _____

_____



Squares/rectangles

**Meaning** _____

_____



Diamonds
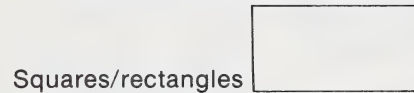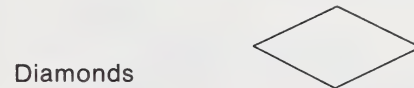
**Meaning** _____

_____

To flowchart a problem, you must think of all the steps involved in solving the problem and the correct order in which they must be completed. For example, tests of certain logic conditions such as true/false, yes/no, greater than/less than/equal to often have to be performed and transfers made to various sections of the program for proper instructions.

In order to end up with valid conclusions, you must program your computer to determine whether the information input by the user is proper. For example, 1. no entry (a blank zero entry), 2. a number, letter, character or word as appropriate, and 3. if a number, whether it is within an acceptable range.

A flowchart has no "dead ends" except for the END of the program. Every step must lead to another step or return to a previous step.

# Practice Flowcharting

Now try sketching your own sample flowcharts. Select a topic you know something about and list the steps. Your flowchart will be more interesting if you pick a topic that has some choices. Here are some suggestions:

- How to make lemonade
- How to groom a show animal
- How to start a lawn mower
- Directions from home to the grocery or school including stop signs, stoplights, intersections, etc.

**YOUR FLOWCHART**

TOPIC:_____

# For More Information

- Read the programming manual that accompanies the microcomputer you are using.
- Visit a computer store or library for more books on programming.

# Up, Up and Away

Now you should be ready to plan and develop some programs. You will need:

- A microcomputer with the BASIC language
- A pencil and paper
- Project book II to review BASIC commands and/or the BASIC manual for your microcomputer

Read each proposed program that follows. Sketch the sequence of instructions as you read the steps. Develop your program statements and commands. Check them for accuracy and an orderly sequence. Then type the program into the microcomputer and hope it runs the first time! If not, then happy "debugging"! (Debugging is the process of finding the errors in the code and making corrections.) If you have great difficulty, find someone who can help you. He or she may be able to spot your errors quickly and save you some frustrating hours!

## Program: *Calendar of Events*
## Objective:

To develop a program that will organize important events such as birthdays, club meetings, holidays, etc., for a given month and display or print the list.

## Benefits:

**1.** Provides for organization of time and events
**2.** Eliminates conflicts in scheduling
**3.** Helps make efficient use of time in a day

## Requirements:
### Equipment
**1.** A microcomputer (and printer if hard copy is desired)
**2.** A calendar
### Data
**1.** Month desired
**2.** Day and important events to be entered

## Procedure:

**1.** Define an array for characters (Hint: C$(I) ) to accept important events for a given month. (See page 24 for information on arrays.)
**2.** Input the month as an individual data item to identify the month to which the list pertains.
**3.** Input each day and the events of the day in chronological order. You may input the time of each event, if desired.
**4.** Use a loop to continue inputting events until all have been entered.
**5.** Use a special code and an IF...THEN statement to end the input of events and terminate the loop.
**6.** Display and/or print the calendar of events.

Remember this is only one way to make a calendarized list of important events. Use your imagination and make some improvements in the program.

## Results

**1.** Did you succeed in preparing a program that worked?

_____

**2.** What problems did you encounter?

_____

_____

_____

**3.** Did you understand how to use arrays?

_____

**4.** What kind of improvements did you attempt?

_____

_____

_____

## Program: _Predicting Beef Animal Market Weight_

## Objective:

To develop a program that will allow you to predict a beef animal's potential market weight and desired average daily gain to reach the potential market weight.

## Benefits:

**1.** Gives a derived weight to set your goals for the animal's market weight
**2.** Aids in determining an animal's average daily gain

## Requirements:

**Equipment**
**1.** A microcomputer (and printer if hard copy is desired)
**2.** Hip-height measurement device
**Data**
**1.** Hip height in inches
**2.** Age of animal in days
**3.** Weight of animal in pounds
**4.** Number of days from date of above measurements to desired market date

## Procedure:

**1.** Use input statements to enter data values for the following items:
  **a.** Hip height in inches, HH
  **b.** Age of animal in days, ND
**2.** Use the above values in the equation below to calculate an adjusted hip height (which is based on a standard age of 205 days):

$AH = ( (205 - ND) * SH) + HH$
where HH and ND are the values entered above
$SH = 0.033$ for steers
   $= 0.025$ for heifers
$AH =$ adjusted hip height

Plan your program to request or use the proper value for the variable SH when computing the adjusted hip height for either steers or heifers.

**3.** Use the value for AH in the following equation to determine the "frame index." ("Frame index" is an indication of the animal's body size and growth potential.) There are two equations—one for steers and one for heifers. Use the proper equation for the animals you are evaluating:

Steers: Frame Index = 3 - ( (39.75 - AH)/2)
Heifers: Frame Index = 3 - ( (39 - AH)/2)

**4.** After computing the frame index, display it on the computer video. Look at the proper table below to find the potential market weight for your animal. The frame index computed by the equations may not be an exact whole number, thus you may have to make an approximation within the range of numbers given.

| STEERS | | HEIFERS | |
|---|---|---|---|
| Frame index | Potential market weight | Frame index | Potential market weight |
| 1 | 750-850 | 1 | 600-700 |
| 2 | 851-950 | 2 | 701-800 |
| 3 | 951-1050 | 3 | 801-900 |
| 4 | 1051-1150 | 4 | 901-1000 |
| 5 | 1151-1250 | 5 | 1001-1100 |
| 6 | 1251-1350 | 6 | 1101-1200 |
| 7 | 1351-1450 | 7 | 1201-1300 |
| 8 | 1451-1550 | 8 | 1301-1400 |
| 9 | 1551-1650 | 9 | 1401-1500 |

**5.** Prepare an input statement to enter the following data values:

PW = potential market weight from the table

WT = animal weight in pounds at time of measurement

TD = number of days from date of measurements to desired market value

**6.** Compute the average daily gain (AG) required for the animal to reach its potential market weight by the following equation:

$$AG = \frac{PW - WT}{TD}$$

**7.** Display all the above data and results on the video in the format below. If a printer is available, prepare your program to use the printer.

**AGE OF ANIMAL** = . . . . .
**HIP HEIGHT** = . . . . . . .
**WEIGHT OF ANIMAL** = . . . . . . .
**DAYS FROM MEASUREMENTS TO MARKET DATE** = . . . . . .
**PREDICTED MARKET WEIGHT** = . . . . . .
**AVERAGE DAILY GAIN REQUIRED** = . . . . .

## Results:

**1.** Is your average daily gain realistic for your animals?

_____

**2.** If not, what changes are required in your data to achieve a realistic daily gain?

_____

**3.** What problems, if any, did you encounter in developing the program?

_____

_____

**4.** Note: contact your Extension agent for information on a feeding schedule to help achieve the desired average daily gain.

## Program: *Home Energy Consumption*

## Objective:

To develop a program that uses natural gas and electric meter readings to compute daily and monthly energy consumption.

## Benefits:

1. Display of energy consumption according to time
2. Indication of peak energy usage
3. Record of past and present energy usage
4. Indication of times to conserve energy
5. Study of how various appliances affect energy consumption

## Requirements:

### Equipment

1. A microcomputer (and printer if a hard copy is desired)
2. Access to home or apartment natural gas and/or electric meters
3. Data sheet for recording meter readings

### Data

1. Dates of daily reading for one month
2. Natural gas meter reading each day
3. Electric meter reading each day

## Procedure:

1. Prepare a data sheet for daily recordings of the date, gas and electric meter readings. A sample of a data sheet form and a daily entry are shown below:

| Date | Gas meter reading in cubic feet | Electric meter reading in kilowatt-hours |
|------|-------------------------------|-----------------------------------------|
| 8/3/83 | 4075 | 67143 |

2. Read the meters serving your house or apartment at approximately the same hour each day and record the data on your data sheet. Accumulate data for a month or more before, or as, you develop your program in order to have ample data available.

3. Develop a program to calculate the Btu's of energy consumed daily for each source, the daily total of both sources, and the sum to date. The input data and results should be displayed and/or printed as shown by the following table:

| Date | Meter Readings | | Daily Btu's | | Daily Total | Sum to Date |
|------|------|----------|------|----------|-------|------|
| | Gas | Electric | Gas | Electric | | |
| -------- | ------ | --------- | ------ | --------- | --------- | --------- |

4. Use the following steps to guide you in developing the program. Remember to sketch a flowchart to help organize the program.

   a. Store the input data in DATA statements. (See page 23 for information on DATA statements.) Each DATA statement should contain the date, the daily natural gas meter reading (cubic feet) and the daily electric meter reading (kilowatt hours). For example, if the date is August 3, 1983, the gas reading is 4075 and the electric reading is 67143, then the DATA statement should be:

   **DATA "8/3/83",4075,67143**

   To include a new day's recording, add a new DATA statement and adjust your program to handle the new data.

   b. Write commands and statements in the BASIC language that will create a loop to READ the data from the DATA statements, compute the daily consumption, the daily total and the sum to date. This computational loop will be repeated once for each day of data available. (Hint: Use three arrays - one for the date such as $D\$(I)$, one for the gas readings such as $G(I)$ and one for the electric readings such as $E(I)$.)

   c. Subtract one day's meter reading from the next day's reading to obtain the cubic feet or kilowatt hours used that day. (Hint: Gas used, GU, equals $G(I)-G(I-1)$ and electricity used, EU, equals $E(I)-E(I-1)$.

   d. Convert the cubic feet of natural gas and kilowatt hours of electricity to Btu's with the relationships:

   1 cubic foot = 1000 Btu's
   1 kilowatt hour = 3413 Btu's

   e. Sum the daily gas and electric Btu's for the daily total (Hint: total daily Btu's, TD, equals BG+BE.)

   f. Add the daily total to the previous sum-to-date for a new sum-to-date. (Hint: SD = SD + TD.)

   g. Display these input data and results on the video or computer printout.

**h.** Repeat the loop until all daily data are used. Then end the program.

## Results:

**1.** Which type of energy (gas or electric) had the highest Btu consumption in your home or apartment?

_____

**2.** Were there any days where the total energy consumption was significantly higher than others?

_____

If so, what days were these and what day of the week?

_____

_____

**3.** Can you determine which appliances or other devices might have been causing the heavy consumption? If so, list them.

_____

_____

_____

_____

**4.** Is there a way some of these appliances could be used less or at a lower energy level?

_____

_____

**5.** Do the total daily Btu's used fluctuate from day to day? If yes, can you explain why?

_____

_____

**Program:** *Beef Feed and Gain Records*

## Objective:
To use the computer to establish records of feed consumed, weight gained, and feed-to-weight gain ratio for a group of beef animals.

## Benefits:
**1.** Provide organized use of data gathered on your animals.
**2.** Show a ratio between the amount of feed the animals consume and the weight gained.
**3.** Maintain a current record of past and present data.
**4.** Aid in making predictions on the correct amount of feed required for other animals.

## Requirements:
**Equipment**
**1.** A microcomputer
**2.** A printer if a copy is desired
**Data**
**1.** Date of each month's input
**2.** Number of animals in the group
**3.** Total weight of animals each month
**4.** Total weight of feed consumed during the month

## Procedures:
**1.** Prepare a data sheet to record the following data once a month on approximately the same day each month:
  **a.** Date
  **b.** Number of animals in the group
  **c.** Total weight of animals in pounds
  **d.** Weight of feed and pasture consumed in one day in pounds
  **e.** Number of days between monthly input dates
The number of animals involved permits averaging of the data and results in case animals are added to or removed from the group during your record period. Obtain the weights of feed (grain, hay, and/or silage) and animals by weighing with proper scales. Remember to include the weight of pasture consumed (on a

| Date | No. of Animals | Total Wt. of Animals | Weights of One Day's Consumption | | | | No. Days in Month |
|---|---|---|---|---|---|---|---|
| | | | Grain | Hay | Silage | Pasture | |
| -------- | ------------- | ---------------- | --------- | --------- | --------- | --------- | ---------------- |

dry matter basis) which can be estimated using tables from your 4-H beef project books. Or you may contact an Extension agent or beef cattle specialist for the information. The above format can be used for your data sheet.

2. Store the data in data statements. Each data statement contains the date, the total current weight of the animals (lbs.), the total amount of feeds (lbs.) consumed on date of entry and the number of days in the month. For example, if the date is September 23, 1983, the current weight of animals is 8500 lbs., the amount of feed consumed on this date is 220 lbs., and there are 30 days in the month, then the DATA statement should be

**DATA "9/23/83",8500,220,30**

(See page 23 for information on DATA-READ statements.) To include a new month's recordings, add a new data statement and adjust your program to handle the new data.

3. Use a READ statement to obtain one month's set of data and then perform the following computations using the data:

a. Add the weights of the feed and pasture consumption to obtain total feed consumed for one day.

b. Multiply the total feed consumed for one day by the number of days in the month to obtain the total feed consumed for the month.

c. Compute the weight gain of the animals during the month by subtracting one month's total weight of animals from the next month's total weight of animals.

e. Compute the ratio of feed-to-weight gain by dividing the total feed consumed in one month by the weight gain of the animals during the month.

f. Display (or print) the results of one month's computations in the following table form, and then loop back through the same READ statement and computations for each month's data until all data are used:

| Date | Total Wt. of Animals | Weight Gain | Total Wt. of Feed | Ratio Feed to Wt. Gain |
|---|---|---|---|---|
| -------- | ------------- | --------- | ------------- | ---------------- |

## Results:

1. What problems, if any, did you encounter?

_____

_____

_____

_____

2. Do you understand the ratio determined?

_____

3. Did the feed efficiency ratio (lbs of feed/lbs of gain) vary from month to month?

Yes_____   No_____

4. If yes, what might have caused the variation?

_____

_____

_____

_____

5. Can you describe some ways to improve the feed efficiency ratio for your animals?

_____

_____

_____

_____

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# Program: *Dairy Feed and Milk Records*

## Objectives:
To establish records of feed consumed, milk produced and price values to calculate a loss or gain of profit for a dairy cow.

## Benefits:
**1.** Provides organized use of data gathered monthly on your dairy cow
**2.** Helps eliminate waste of resources and income
**3.** Retains past records for future use
**4.** Simplifies projections of cost of production
**5.** Shows a calculated gain or loss of income produced by a single cow

## Requirements:
**Equipment**
**1.** Microcomputer
**2.** Paper for data recording
**Data**
**1.** Date of input
**2.** Weight of milk produced and silage, grain and hay consumed
**3.** Price of milk produced and silage, grain and hay purchased or produced

## Procedures:
**1.** Prepare a data sheet to record the following data taken once a month on approximately the same day each month.
  **a.** Date
  **b.** Weight and price of milk
  **c.** Weight and price of silage
  **d.** Weight and price of grain
  **e.** Weight and price of hay
  **f.** Number of days between monthly dates

Obtain the weights of feed (grain, hay, and/or silage) with proper scales or measurement instruments. Consult your Extension agent for price tables of the value of feed (grain, hay and/or silage) and milk produced. The two tables shown below can be used for your data sheet:

TABLE 1

| DATE | WEIGHT OF SILAGE | WEIGHT OF GRAIN | WEIGHT OF HAY | WEIGHT OF MILK |
|------|------------------|-----------------|---------------|----------------|
|      |                  |                 |               |                |
|      |                  |                 |               |                |
|      |                  |                 |               |                |
|      |                  |                 |               |                |
|      |                  |                 |               |                |

TABLE 2

| PRICE OF SILAGE | PRICE OF GRAIN | PRICE OF HAY | PRICE OF MILK | NUMBER OF DAYS IN MONTH |
|-----------------|----------------|--------------|---------------|-------------------------|
|                 |                |              |               |                         |
|                 |                |              |               |                         |
|                 |                |              |               |                         |
|                 |                |              |               |                         |
|                 |                |              |               |                         |

**2.** Store the data in DATA statements, adding a new statement for each month's data. Each DATA statement contains the date, weight and price of silage, grain, hay and milk on the measurement date. If the date is October 3, 1983, weight and price of silage is 18 lbs. @ .015, grain is 7 lbs. @ .05, hay is 19 lbs. @ .035, amount of milk is 70 lbs. @ .13 and the number of days is 30, then the DATA statement would look as follows:

**DATA "10/3/83",18,7,19,70,.015,.05, .035,13,30**

(See page 23 for information on DATA-READ statements.) To include a new month's recordings, add a new data statement and adjust your program to handle the new data.

**3.** Use a READ statement to obtain one month's set of data and then perform the following computations using the data:

**a.** Multiply the silage, hay and grain consumed in one day by the number of days in the month. This will give you an approximate total for one month's consumption in each category.

**b.** Multiply the milk produced for one day by the number of days in the month to obtain an approximate total for one month.

**c.** Compute the cost of feed and value of milk by multiplying the price of silage, hay, grain and milk by the totals for one month as calculated in (a) and (b) above.

**d.** Calculate your own production gain or loss by subtracting all your cost of feed from the value of milk produced.

**e.** Display (or print) the results of one month's computations in the following table form. Now loop back to the READ statement for each month until all data are used.

| DATE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL |
|------|-------|-------|-------|-------|-------|
|      | COST OF SILAGE | COST OF GRAIN | COST OF HAY | PROFIT OF MILK | GAIN OR LOSS +/- |
|      |       |       |       |       |       |
|      |       |       |       |       |       |
|      |       |       |       |       |       |
|      |       |       |       |       |       |
|      |       |       |       |       |       |

## Results:

**1.** What problems did you encounter?

_____

_____

_____

**2.** Did your production gain vary in amounts?

Yes_____    No_____

Why?

_____

_____

_____

_____

**3.** What kind of improvements did you incorporate to make this program more useful to you, if any?

_____

_____

_____

_____

**4.** How could this recordkeeping concept be useful in other activities?

_____

_____

_____

**5.** Did you understand READ-DATA statements?

_____

**Program:** *Dairy Lactation Projections*

## Objective:

To predict the annual milk production of a given dairy cow based on a 10-month lactation period starting in the first month after freshening.

## Benefits:

1. Predict annual milk production
2. Predict if given cow will produce a profit
3. Assist in future projections by recall of past and present records
4. Assist in making decisions resulting in good herd management

## Requirements:

### Equipment
1. Microcomputer
2. Paper for data recording

### Data
1. Date of each month when milk weight is taken
2. Weight of milk taken once each 30 days

## Procedures:

1. Enter the 10 percentages below into an array (P(I)) of 10 elements with a loop and READ statement. (NOTE: See information on arrays on page 24 and DATA-READ on page 23.)

> **DATA** 13.9, 14.7, 13.9, 12.7, 11.4, 10.1, 8.6, 7.0, 4.7, 3.0

In order to make predictions of milk production you must have certain data. The values above for each month's recordings in the lactation cycle are produced from a normal lactation curve on a 30-day interval. For example, 14.7 matches the second recorded month, and 3.0 matches the tenth month. This program is designed to take milk values starting with the first month after freshening to the end of lactation. The percentage values are dependent on this cycle.

2. Store the pounds of milk weighed on the 30th day in the data statement. Each DATA statement should contain one month's milk weight reading and the date. For example, if the date is June 4, 1983 and the milk weight on the 30th day of the month is 70 pounds, then the DATA statement would look as follows:

> **DATA "6/4/83",70**

(NOTE: See page 23 for information on DATA-READ statements.) To include a new month's milk production, add a new DATA statement and adjust your program to handle the new data.

3. Use a READ statement to obtain one month's set of data and then perform the following computations using the data:

   **a.** Read each DATA statement and then run the milk weight value through the equations below. For each month's data, run through these equations to come up with the prediction value.

$$T = T + P(I)$$
$$TO = TO + (MK * 30.4)$$
$$PD = TO * (100/T)$$

P(I) = percentage array for 10 months where the number I = the Ith month
T = total added percentages to date
TO = total milk produced to date
MK = milk weight in pounds
PD = prediction

The PD (prediction) is the value for the year's production from this month's data. These predictions are approximations and are not necessarily precise; however, if your cow's predictions vary greatly in amounts, you may have some problem with your program.

   **b.** Calculate the amount from the month's approximation in the table by multiplying pounds of milk and 30.4 days to show an approximate total for that month.

   **c.** Display (or print) the results of one month's computations in the following table form. Now loop back to the READ statement for each month's data until all data are used.

| DATE | WEIGHT OF MILK | MONTH'S APPROXIMATION | YEARLY PREDICTION |
|------|----------------|------------------------|--------------------|
|      |                |                        |                    |
|      |                |                        |                    |
|      |                |                        |                    |
|      |                |                        |                    |
|      |                |                        |                    |
|      |                |                        |                    |

## Results:

**1.** What problems did you encounter developing your program?

_____

_____

_____

_____

**2.** Do the predictions vary a great amount?

Yes_____   No_____

Why?

_____

_____

_____

_____

**3.** Did you have problems with the arrays and READ-DATA statements?

_____

_____

**4.** Was the prediction accurate?_____

# DATA and READ Statements

The DATA and READ statements are valuable techniques for storing and retrieving information within a program. The following program is an example of how the READ statement acquires information from the DATA statement. If a microcomputer is available, type the program into the microcomputer and run it. Observe what is displayed.

```
10 READ A,B,C
20 DATA 1,2,3
30 PRINT A
40 PRINT B
50 PRINT C
60 END
```

The value of A is 1, B is 2, and C is 3. The READ statement obtains and assigns the values one by one from first to last in the DATA statement. The comma separates the variables in the READ statement and separates the data elements in the DATA statement.

The following example uses words (or characters) instead of numbers. Notice the difference in the variables used. (Remember the difference from Project II?) Type and run this program and observe the results.

```
10 READ A$,B$,C$
20 DATA "HI", "HELLO", "GREETINGS"
30 PRINT A$
40 PRINT B$
50 PRINT C$
60 END
```

The variables A$, B$ and C$ are assigned values in the same manner as the numbers in the above example.

The next example of DATA and READ statements uses only one variable to read all three numbers. Type this program and run it.

```
10 FOR I = 1 TO 3
20 READ A
30 PRINT A
40 NEXT I
50 DATA 10,20,30
60 END
```

Notice that each time a READ A statement is executed, it reads the next value in the DATA statement. The variable A is assigned a new value each time through the FOR...NEXT loop. Using words or characters will work the same way if the proper variable type is used.

Remember that the number of times the READ statement is executed cannot exceed the number of items in the DATA statement or an error will occur.

The next example will be useful in developing programs in this project. (Refer to the explanation on arrays.) Type this program and run it. Observe the results.

```
10 DIM A(3)
20 FOR I = 1 TO 3
30 READ A(I)
40 NEXT I
50 PRINT A(1),A(2),A(3)
60 DATA 5,10,15
70 END
```

Notice that the values in positions 1, 2 and 3 of the array A(I) contain the values in the order listed in the DATA statement. These values remain in the same positions through the program until replaced. Now, let's add a new DATA statement in the next example and observe the action at the end of one DATA statement when the READ statement searches for more data. Add the changes below to the above program.

```
10 DIM A(6)
20 FOR I = 1 TO 6
55 PRINT A(4),A(5),A(6)
65 DATA 20,25,30
```

Notice that by adding the new DATA statement and increasing the number of times the READ statement is performed, the READ statement automatically goes to a new DATA statement to continue its search for data information. DATA statements can be anywhere in a program. These examples can assist you in developing the programs in this project. Be sure you understand them before proceeding.

# Arrays

Arrays are valuable techniques in computer programming. They give the programmer the ability to assign many values to the same variable name. Arrays can be defined in different dimensions, but in this project you will work with the one-dimensional array. There are two types of arrays: numeric and character.

Example of a numeric array of eight elements:

| 1 | 4 | 7 | 8 | 12 | 11 | 6 | 50 |

Example of a character array of eight elements:

"CAT" "DOG" "SHEEP" "HOUSE" "DOCTOR" "DENTIST" "POLICEMAN" "HILL"

The numeric and character arrays are assigned in the following format in the BASIC language.

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| NUMERIC ARRAY | CHARACTER ARRAY |
|---|---|
| A(1) = 1 | A$(1) = "CAT" |
| A(2) = 4 | A$(2) = "DOG" |
| A(3) = 7 | A$(3) = "SHEEP" |
| A(4) = 8 | A$(4) = "HOUSE" |
| A(5) = 12 | A$(5) = "DOCTOR" |
| A(6) = 11 | A$(6) = "DENTIST" |
| A(7) = 6 | A$(7) = "POLICEMAN" |
| A(8) = 50 | A$(8) = "HILL" |

Let's examine the meaning of the array A(2) = 4.

The "A" is a numeric variable for the numeric array. The "(2)" is the position in the array in which you are going to assign a value. The action taking place is the assigning of array position "A(2)" as equal to the number "4." Notice the rest of the eight elements. The assigning of a character array is basically the same except for the $ following the variable. There is a special DIM statement in BASIC required to define an array. This DIM statement allows the creation of arrays. For example, if you want a numeric array of eight elements with the variable name "A," place this DIM statement at the beginning of the program.

DIM A(8)

The following program will assign all the values of the numeric array listed previously. The character array would be represented in a similar manner. Type and RUN this program and observe the results.

```
 10 DIM A(8)
 20 A(1) = 1
 30 A(2) = 4
 40 A(3) = 7
 50 A(4) = 8
 60 A(5) = 12
 70 A(6) = 11
 80 A(7) = 6
 90 A(8) = 50
100 FOR I = 1 TO 8
110 PRINT A(I)
120 NEXT I
130 END
```

Notice the loop beginning at line 100. This loop is used to print the values of the array. The "A(I)" allows you to print all eight values in a loop by simply changing the value of "I" each time. You can input the values of all the positions in the array in a similar procedure. The DATA and READ statement can be used to load information into an array. After studying the previous DATA and READ statement section, look at the example below. Type and run the program and observe the results.

```
10 DIM A(8)
20 FOR I = 1 TO 8
30 READ A(I)
35 PRINT A(I)
40 NEXT I
50 DATA 2,4,7,8,12,11,6,50
60 END
```

This program will allow you to enter the contents of the DATA statement into array "A." Using this concept allows you to enter large amounts of data into arrays—whether it is character or numeric data.

Completing and understanding this exercise on arrays is valuable in helping you complete the activities in this project. There is a more advanced way to enter large amounts of data; that is, through the use of files. While this method is not used in this project, you can learn more about files using the materials on the BASIC language for your computer.

# Demonstrations and Illustrated Talks

Give a demonstration or illustrated talk on computers to help others learn.

- Research the uses of some available computer software and tell your 4-H group what you have learned.
- Demonstrate how to use several available 4-H computer programs such as the ones listed in this project.
- Show how to develop a program.
- Give some examples of the uses of ARRAYS and DATA-READ statements in development of programs.

# Conclusion

This project has exposed you to many important aspects about hardware, software, benefits of microcomputers, advantages of existing software, and how to develop your own program. You have also learned about two new functions in BASIC: 1) ARRAYS, and 2) DATA-READ statements. Computer programming does not stop here! There are many advanced computer programming commands, techniques and languages that have not been discussed. More information on computer programming can be obtained by reading books, talking to professionals, and taking courses to broaden your knowledge. Computer programming is the way of the future and will affect us all. The more you know about it will put you one step into tomorrow. Good Luck!

# 4-H Computer Project III:
## *Using Computers in 4-H Projects*

## PROJECT RECORD FORM

**Name** _____ **School** _____

**County** _____ **Birth Date** _____

**Name of 4-H Club/Group** _____ **Today's Date** _____

A. Tell what you learned in this project (for example, how to develop a flowchart and how to use arrays and DATA-READ statements).

_____

_____

_____

_____

_____

_____

B. List any activity related to this project in which you participated, such as group meetings, tours, exhibits, demonstrations.

_____

_____

_____

_____

_____

C. List any awards or recognition you have received in this project.

_____

_____

_____

_____

_____

D. If you helped others with their computer project, give the number of people you helped and what you did to help them.

_____

_____

_____

_____

_____

**E.** Write a story telling what you did and learned including how the project helped you, who helped you with the project, and why computers are important to us.

_____
_____
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_____

**APPROVED:** _____     _____
                   _Project Leader_                         _Parent_

**Alberta**
AGRICULTURE
4–H BRANCH